Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

American Academy of Orthopaedic Surgeons clinical practice guideline on management of osteoarthritis of the hip.

Bibliographic Source(s)

American Academy of Orthopaedic Surgeons (AAOS). American Academy of Orthopaedic Surgeons clinical practice guideline on management of osteoarthritis of the hip. Rosemont (IL): American Academy of Orthopaedic Surgeons (AAOS); 2017 Mar 13. 850 p. [96 references]

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement

	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
	Search Strategy
	Study Selection
	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
	Grading the Quality or Strength of Evidence
	Benefits and Harms of Recommendations
	Evidence Summary Supporting Recommendations
	Rating the Strength of Recommendations
	Specific and Unambiguous Articulation of Recommendations
	External Review
	Updating

Recommendations

Major Recommendations

Definitions of the strength of recommendations (Strong, Moderate, Limited, and Consensus) and Strength Visual (â˜…â˜…â˜…â˜…, â˜…â˜…â˜…â˜…, â˜…â˜…â˜…, â˜…â˜…â˜…, â˜…) are provided at the end of the "Major Recommendations" field.

Note from the American Academy of Orthopaedic Surgeons (AAOS): The following is a summary of the recommendations of the AAOS Clinical Practice Guideline on the Management of Osteoarthritis of the Hip. All readers of this summary are strongly urged to consult the full guideline and evidence report for this information. The AAOS work group is confident that those who read the full guideline and evidence report will see that the recommendations were developed using systematic evidence-based processes designed to combat bias, enhance transparency, and promote reproducibility.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician, and other healthcare practitioners.

Summary of Recommendations

Risk Assessment Tools

Moderate strength evidence supports that the practitioner could use risk assessment tools to assist in

predicting adverse events, assessing surgical risks and educating patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Obesity as a Risk Factor

Moderate strength evidence supports that obese patients with symptomatic osteoarthritis of the hip, when compared to non-obese patients, may achieve lower absolute outcome scores but a similar level of patient satisfaction and relative improvement in pain and function after total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…
Limited strength evidence supports that obese patients with symptomatic osteoarthritis of the hip, when compared to non-obese patients, have increased incidence of postoperative dislocation, superficial wound infection, and blood loss after total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…

Age as a Risk Factor

Moderate strength evidence supports that increased age is associated with lower functional and quality of life outcomes in patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…
Limited strength evidence supports that increased age may be associated with a higher risk of mortality in patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…
Limited strength evidence supports that younger age may be associated with a higher risk of revision in patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…

Mental Health Disorder as a Risk Factor

Moderate strength evidence supports that mental health disorders, such as depression, anxiety, and psychosis, are associated with decreased function, pain relief, and quality of life outcomes in patients with symptomatic osteoarthritis of the hip who undergo total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Tobacco Use

Limited strength evidence supports that patients who use tobacco products are at an increased risk for complications after total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…

Non-narcotic Management

Strong evidence supports that nonsteroidal anti-inflammatory drugs (NSAIDs) improve short-term pain, function, or both in patients with symptomatic osteoarthritis of the hip. Strength of Recommendation: Strong Evidence â˜…â˜…â˜…â˜…

Glucosamine Sulfate

Moderate strength evidence does not support the use of glucosamine sulfate because it did not perform better than placebo for improving function, reducing stiffness and decreasing pain for patients with symptomatic osteoarthritis of the hip. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Intraarticular Injectables

Strong evidence supports the use of intraarticular corticosteroids to improve function and reduce pain in the short-term for patients with symptomatic osteoarthritis of the hip. Strength of Recommendation: Strong Evidence â˜…â˜…â˜…â˜…
Strong evidence does not support the use of intraarticular hyaluronic acid because it does not perform better than placebo for function, stiffness, and pain in patients with symptomatic osteoarthritis of the hip. Strength of Recommendation: Strong Evidence â˜…â˜…â˜…â˜…

Physical Therapy as a Conservative Treatment

Strong evidence supports the use of physical therapy as a treatment to improve function and reduce pain for patients with osteoarthritis of the hip and mild to moderate symptoms. Strength of Recommendation: Strong Evidence â˜…â˜…â˜…â˜…

Preoperative Physical Therapy

Limited evidence supports the use of preoperative physical therapy to improve early function in patients with symptomatic osteoarthritis of the hip following total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…

Anesthetic Types

Limited evidence supports the use of neuraxial anesthesia compared to general anesthesia to reduce complications in patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Limited Evidence â˜…â˜…

Tranexamic Acid

Moderate strength evidence supports that the practitioner could use intravenous or topical tranexamic acid for patients with symptomatic osteoarthritis of the hip who are undergoing total hip arthroplasty as a part of the effort to reduce blood loss. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Approach Exposure

Moderate strength evidence supports that there were no clinically significant differences in patient oriented outcomes related to the surgical approach for patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Postoperative Physical Therapy

Moderate evidence supports the use of post-operative physical therapy because it could improve early function to a greater extent than no physical therapy management for patients with symptomatic osteoarthritis of the hip who have undergone total hip arthroplasty. Strength of Recommendation: Moderate Evidence â˜…â˜…â˜…

Definitions

Strength of Recommendation Descriptions

Strength	Overall Strength of Evidence	Description of Evidence Quality	Strength Visual
Strong	Strong	Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention.	â˜…â˜…â˜…â˜…
Moderate	Moderate	Evidence from two or more "Moderate" quality studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.	â˜…â˜…â˜…
Limited	Low Strength Evidence or Conflicting Evidence	Evidence from one or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study for recommending for or against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.	â˜…â˜…
Consensus*	No Evidence	There is no supporting evidence. In the absence of reliable evidence, the guideline development group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.	â˜…

*Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII of the original guideline document.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Hip osteoarthritis

Guideline Category

Management

Risk Assessment

Treatment

Clinical Specialty

Family Practice

Geriatrics

Orthopedic Surgery

Physical Medicine and Rehabilitation

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Occupational Therapists

Physical Therapists

Physician Assistants

Physicians

Guideline Objective(s)

- To help improve treatment of hip osteoarthritis based on the current best evidence
- To serve as an information resource for decision makers and developers of practice guidelines and recommendations

Target Population

Adult patients (age 18 years or older) with osteoarthritis of the hip

Note: This guideline is not intended to address management of pediatric patients with osteoarthritis or patients with inflammatory arthritis or osteonecrosis of the hip.

Interventions and Practices Considered

1. Use of risk assessment tools to assist in predicting adverse events, assessing surgical risks, and educating patients before hip arthroplasty
2. Consideration of risk factors for hip arthroplasty
    - Obesity
    - Patient age
    - Mental health disorders
    - Tobacco use
3. Non-narcotic pain management (nonsteroidal anti-inflammatory drugs [NSAIDs])
4. Glucosamine sulfate for hip arthritis pain and hip function (not recommended)
5. Intraarticular corticosteroids for hip arthritis pain and hip function
6. Intraarticular hyaluronic acid for hip arthritis pain and hip function (not recommended)
7. Preoperative physical therapy
8. Neuraxial anesthesia compared to general anesthesia
9. Intravenous or topical tranexamic acid to reduce blood loss in patients undergoing total hip arthroplasty
10. Surgical approach for hip arthroplasty
11. Use of postoperative physical therapy
12. Physical therapy as a conservative treatment

Note: The following were considered but no evidence was discovered to make recommendations: diabetes as a risk factor, social comorbidities as a risk factor, use of prescription opioids, use of cannabis, methicillin-resistant *Staphylococcus aureus* (MRSA) screening, and dysplasia as a risk factor.

Major Outcomes Considered

- Physical function
- Reoperation
- Pain change from baseline
- Mental component change from baseline
- Length of hospital stay
- Implant revision
- Quality of life
- Patient satisfaction
- Complications of surgery
- Mortality

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Study Selection Criteria

The American Academy of Orthopaedic Surgeons (AAOS) developed *a priori* article inclusion criteria for review. These criteria are "rules of evidence" and articles that did not meet them are, for the purposes of this guideline, not evidence.

To be included in the systematic reviews (and hence, in this guideline) an article had to meet the following criteria:

Criteria to Be Customized by Work Group (by PICO Question or Stage of Care, If Necessary)

Study must be of an osteoarthritis (OA)-related injury or prevention thereof
Study must be published in or after 1990 for *surgical treatment, rehabilitation, bracing, prevention and magnetic resonance imaging (MRI)*
Study must be published in or after 1990 for *x-rays* and *non-operative treatment*
Study must be published in or after 1990 for all others non specified
Study should have 10 or more patients per group (*Work group may further define sample size*)
Study must have at least 90% OA patients

Standard Criteria for All Clinical Practice Guidelines

Article must be a full peer-reviewed published article report of a clinical study.
Retrospective non-comparative case series, medical records review, meeting abstracts, historical articles, editorials, letters, and commentaries are *excluded*.
Confounded studies (i.e., studies that give patients the treatment of interest AND another treatment) are *excluded*.
Case series studies that have non-consecutive enrollment of patients are *excluded*.
Controlled trials in which patients were not stochastically assigned to groups AND in which there was either a difference in patient characteristics or outcomes at baseline AND where the authors did not statistically adjust for these differences when analyzing the results are *excluded*.
All studies of "Very Weak" strength of evidence are *excluded*.
All studies evaluated as Level V will be *excluded*.
Composite measures or outcomes are *excluded* even if they are patient-oriented.
Study must appear in a peer-reviewed publication.
For any included study that uses "paper-and-pencil" outcome measures (e.g., 36-Item Short Form Health Survey [SF-36]), only those outcome measures that have been validated will be included.
For any given follow-up time point in any included study, there must be ≥50% patient follow-up (if the follow-up is >50% but <80%, the study quality will be downgraded by one Level).
Study must be of humans.
Study must be published in English.
Study results must be quantitatively presented.
Study must not be an in vitro study.
Study must not be a biomechanical study.
Study must not have been performed on cadavers.

Surrogate outcomes will only be evaluated when no patient oriented outcomes are available.

Literature Searches

The systematic review began with a comprehensive search of the literature. Articles considered were published between January 1, 1990 and April 15, 2016 in four electronic databases: PubMed, EMBASE, CINAHL, and The Cochrane Central Register of Controlled Trials. The medical librarian conducts the search using key terms determined from the guideline development group's PICO (Patient, Intervention, Comparison, and Outcome) questions.

The electronic search was supplemented with a manual search of the bibliographies of all retrieved

publications, recent systematic reviews, and other review articles for potentially relevant citations. Recalled articles are evaluated for possible inclusion based on the study selection criteria and are summarized for the guideline development group who assist with reconciling possible errors and omissions.

The study attrition diagram in Appendix IV of the original guideline document provides a detailed description of the numbers of identified abstracts and recalled and selected studies that were evaluated in the systematic review of this guideline. The search strategies used to identify the abstracts are contained in Appendix V of the original guideline document.

Overview of Cost Literature Review Process

In December of 2015 the AAOS Board of Directors approved the integration of a systematic cost literature review into the appendices of a clinical practice guideline (CPG). To prevent bias when creating a CPG recommendation, the guideline work group is blinded to the cost literature review findings until after the final recommendations are constructed; it is important that the CPG is based on a systematic review of the comparative effectiveness research for each PICO question, rather than the cost savings of one procedure over another. All findings related to the cost literature review are presented in the appendices of each CPG, to help ensure that the recommendations and their supporting rationales are kept separate from the findings of the cost literature review. Additionally, cost statements will only be made if evidence regarding an item addressed in the CPG is available; if no cost literature is available, a statement will not be made.

Search Strategy

A review of published systematic reviews addressing cost benefits of various procedures related to hip fractures was conducted to evaluate any cost-effectiveness literature findings supporting the recommendations made in the 2016 AAOS Clinical Practice Guideline on the Management of Osteoarthritis of the Hip. To identify possibly relevant cost-effectiveness literature, the AAOS medical librarian conducted a search on July 7, 2016 for cost-effectiveness literature published between January 1, 1990 and July 7, 2016 that addressed any topics included in the aforementioned guideline (see Appendix XI in the original guideline document for literature search report). The search returned 1246 abstracts.

After the search results were returned, an AAOS Evidence-Based Medicine Unit research analyst reviewed the abstracts and recalled the full text articles for any abstracts that contained any of the key terms listed in Appendix XI of the original guideline document in article title or abstract. The articles not containing the key terms in the title or abstract were reviewed separately and their full text was recalled if deemed relevant. A total of 158 studies were recalled. After the full text articles were recalled, the Evidence-Based Medicine (EBM) analyst included five studies relevant to the guideline recommendations under study. The author conclusions from each of the studies were extracted and categorized depending on the guideline recommendations that they supported (see "Cost Literature Review Findings" in Appendix XI of the original guideline document).

Number of Source Documents

A total of 97 articles were included after full text review and quality analysis (see the Study Attrition Flowchart in Appendix IV of the original guideline document).

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Methods for Evaluating Evidence

Resources used to develop the Quality Appraisal Systems:

GRADE Working Group. Grading quality of evidence and strength of recommendations. *BMJ 2004; (328)*: 1490-1494.

Prognostic Study Quality Appraisal Questions

The following questions are used to evaluate the study quality of prognostic study designs.

Was the spectrum of patients studied for this prognostic variable representative of the patient spectrum seen in actual clinical practice?
Was loss to follow up unrelated to key characteristics?
Was the prognostic factor of interest adequately measured in the study to limit potential bias?
Was the outcome of interest adequately measured in study participants to sufficiently limit bias?
Were all important confounders adequately measured in study participants to sufficiently limit potential bias?
Was the statistical analysis appropriate for the design of the study, limiting potential for presentation of invalid results?

Prognostic Study Design Quality Key

High Quality Study	<1 Flaw
Moderate Quality Study	≥1 and <2 Flaws
Low Quality Study	≥2 and <3 Flaws
Very Low Quality Study	≥3 Flaws

Randomized Study Quality Appraisal Questions

The following domains are evaluated to determine the study quality of randomized study designs.

Random sequence generation
Allocation concealment
Blinding of participants and personnel
Incomplete outcome data
Selective reporting
Other bias

Upgrading Randomized Study Quality Questions

Is there a large magnitude of effect?
Influence of all plausible residual confounding
Dose-response gradient

Randomized Study Design Quality Key

High Quality Study	<2 Flaws
Moderate Quality Study	≥2 and <4 Flaws
Low Quality Study	≥4 and <6 Flaws
Very Low Quality Study	≥6 Flaws

Observational Study Design Quality Appraisal Questions

The following questions are used to evaluate the study quality of observational study designs. Note that all observation studies begin the appraisal process at "low quality" due to design flaws inherent in observational studies.

Is this observational study a prospective case series?
Does the strategy for recruiting participants into the study differ across groups?
Did the study fail to balance the allocation between the groups or match groups (e.g., through stratification, matching, propensity scores)?
Were important confounding variables not taken into account in the design and/or analysis (e.g., through matching, stratification, interaction terms, multivariate analysis, or other statistical adjustment such as instrumental variables)?
Was the length of follow-up different across study groups?
Other bias?

Upgrading Observational Study Quality Questions

Is there a large magnitude of effect?
Influence of all plausible residual confounding
Dose-response gradient

Observational Study Design Quality Key

High Quality Study	<2 Flaws
Moderate Quality Study	≥2 and <4 Flaws
Low Quality Study	≥4 and <6 Flaws
Very Low Quality Study	≥6 Flaws

Methods Used to Analyze the Evidence

Meta-Analysis

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Best Evidence Synthesis

Only the best available evidence for any given outcome addressing a recommendation was included. Accordingly, the authors first included the highest quality evidence for any given outcome if it was available. In the absence of two or more occurrences of an outcome at this quality, the authors considered outcomes of the next lowest quality until at least two or more occurrences of an outcome had been acquired. For example, if there were two 'moderate' quality occurrences of an outcome that addressed a recommendation, the authors did not include 'low' quality occurrences of this outcome. A summary of the evidence that met the inclusion criteria, but was not best available evidence, was created and can be viewed by recommendation in Appendix XII in the original guideline document.

Statistical Methods

Analysis of Intervention/Prevention Data

When possible, the American Academy of Orthopaedic Surgeons (AAOS) Evidence-based Medicine (EBM) Unit recalculates the results reported in individual studies and compiles them to answer the recommendations. The results of all statistical analysis conducted by the AAOS EBM Unit are conducted using SAS 9.4. SAS was used to determine the magnitude, direction, and/or 95% confidence intervals of the treatment effect. For data reported as means (and associated measures of dispersion) the mean difference between groups and the 95% confidence interval was calculated and a two-tailed t-test of independent groups was used to determine statistical significance. When published studies report

measures of dispersion other than the standard deviation the value was estimated to facilitate calculation of the treatment effect. In studies that report standard errors or confidence intervals the standard deviation was back-calculated. In some circumstances statistical testing was conducted by the authors and measures of dispersion were not reported. In the absence of measures of dispersion, the results of the statistical analyses conducted by the authors (i.e., the p-value) are considered as evidence. For proportions, the proportion of patients that experienced an outcome along with the percentage of patients that experienced an outcome are reported. The variance of the arcsine difference was used to determine statistical significance. P-values <0.05 were considered statistically significant.

When the data was available, meta-analyses were performed using the random effects method of DerSimonian and Laird. A minimum of three studies was required for an outcome to be considered by meta-analysis. Heterogeneity was assessed with the I-squared statistic. Meta-analyses with I-squared values less than 50% were considered as evidence. Those with I-squared larger than 50% were not considered as evidence for this guideline. All meta-analyses were performed using SAS 9.4. The arcsine difference was used in meta-analysis of proportions. In order to overcome the difficulty of interpreting the magnitude of the arcsine difference, a summary odds ratio is calculated based on random effects meta-analysis of proportions and the number needed to treat (or harm) is calculated. The standardized mean difference was used for meta-analysis of means and magnitude was interpreted using Cohen's definitions of small, medium, and large effect.

Economic Evaluation Studies, Critical Appraisal

The Evers 2005 and Drummond 1996 checklists were used to construct an assessment form to evaluate economic evaluation studies. These checklists were chosen because they are both recommended by the Cochrane Collaboration.

Details Regarding Checklist Appraisal

The aforementioned checklists were amalgamated, added to the electronic PEER Tool's study quality appraisal functionality, and employed by AAOS staff to assess the relevant domains for each included economic evaluation study relevant to this report. The checklist contains 20 questions, which have been categorized into 10 different domains considered important among health economists.

There is little research to show whether some domains are more important than others regarding quality of the economic article. With a large range of possible methodologies and study designs in economic evaluations, it is also unclear if every question will be relevant all of the time. An economic evaluation not reporting everything on the list may not necessarily invalidate its results. It is not recommended to use the checklist to try and assign quality or rank the studies based on the answers of these questions. Rather the checklist should be used as an information tool to assist the readers/users of guidelines to determine whether the results of a particular study are relevant and applicable to their own objectives (e.g., cost of one intervention versus another intervention that are both accessible to the user in his or her clinical setting).

Economic Study Quality Evaluation

The study design and methodology for all included cost-effectiveness studies in this report were evaluated using the 20 domains/questions listed in Table 2 of the original guideline document.

Methods Used to Formulate the Recommendations

Expert Consensus (Nominal Group Technique)

Description of Methods Used to Formulate the Recommendations

This guideline and systematic review were prepared by the American Academy of Orthopaedic Surgeons (AAOS) management of osteoarthritis of the hip guideline multidisciplinary clinician guideline

development group with the assistance of the AAOS Evidence-Based Medicine (EBM) Unit in the Department of Research and Scientific Affairs (methodologists) at the AAOS. The guideline development group held an introductory meeting on February 27, 2015 to establish the scope of the guideline and the systematic reviews. As the physician experts, the guideline development group defined the scope of the guideline by creating PICO Questions (i.e., population, intervention, comparison, and outcome) that directed the literature search. The original PICO questions developed at the introductory meeting can be viewed in Appendix III in the original guideline document. When necessary, these clinical experts also provided content help, search terms and additional clarification for the AAOS medical librarian. The medical librarian created and executed the search(es). The supporting group of methodologists (AAOS EBM Unit) reviewed all abstracts, recalled pertinent full-text articles for review and evaluated the quality of studies meeting the inclusion criteria. They also abstracted, analyzed, interpreted, and/or summarized the relevant data for each recommendation and prepared the initial draft for the final meeting. Upon completion of the systematic reviews, the physician guideline development group participated in a two-day recommendation meeting on August 27-28, 2016. At this meeting, the physician experts and methodologists evaluated and integrated all material to develop the final recommendations. The final recommendations and rationales were edited, written and voted on at the final meeting. Additional edits to the rationales were approved by the guideline development group on webinars after the meeting. The draft guideline recommendations and rationales received final review by the methodologists to ensure that these recommendations and rationales were consistent with the data. The draft was then completed and submitted for peer review on July 6, 2015.

The resulting draft guidelines were then peer-reviewed, edited in response to that review and subsequently sent for public commentary. Thereafter, the draft guideline was sequentially approved by the AAOS Committee on Evidence-Based Quality and Value, AAOS Council on Research and Quality, and the AAOS Board of Directors. All AAOS guidelines are reviewed and updated or retired every five years in accordance with the criteria of the National Guideline Clearinghouse (NGC).

Thus the process of AAOS guideline development incorporates the benefits from clinical physician expertise as well as the statistical knowledge and interpretation of non-conflicted methodologists. The process also includes an extensive review process offering the opportunity for over 200 clinical physician experts to provide input into the draft prior to publication. This process provides a sound basis for minimizing bias, enhancing transparency and ensuring the highest level of accuracy for interpretation of the evidence.

Formulating PICO Questions

The guideline development group began work on this guideline by constructing a set of PICO questions. These questions specify the patient population of interest (P), the intervention of interest (I), the comparisons of interest (C), and the patient-oriented outcomes of interest (O). They function as questions for the systematic review, not as final recommendations or conclusions. A full list of the original PICO questions can be viewed in Appendix III in the original guideline document. Once established, these *a priori* PICO questions cannot be modified until the final guideline development group meeting.

Defining the Strength of the Recommendations

Judging the quality of evidence is only a stepping stone towards arriving at the strength of a guideline recommendation. The strength of recommendation also takes into account the quality, quantity, and the trade-off between the benefits and harms of a treatment, the magnitude of a treatment's effect, and whether there is data on critical outcomes.

Strength of recommendation expresses the degree of confidence one can have in a recommendation. As such, the strength expresses how possible it is that a recommendation will be overturned by future evidence. It is very difficult for future evidence to overturn a recommendation that is based on many high quality randomized controlled trials that show a large effect. It is much more likely that future evidence will overturn recommendations derived from a few small retrospective comparative studies. Consequently, recommendations based on the former kind of evidence are given a high strength of recommendation and

recommendations based on the latter kind of evidence are given a low strength.

To develop the strength of a recommendation, AAOS staff first assigned a preliminary strength for each recommendation that took only the final strength of evidence (including quality and applicability) and the quantity of evidence (see the "Rating Scheme for the Strength of the Recommendations" field).

Wording of the Final Recommendations

To prevent bias in the way recommendations are worded, the AAOS uses specific predetermined language stems that are governed by the evidence strengths. Each recommendation was written using language that accounts for the final strength of the recommendation.

AAOS Guideline Language Stems

Guideline Language	Strength of Recommendation
Strong evidence supports that the practitioner should/should not do X, because…	Strong
Moderate evidence supports that the practitioner could/could not do X, because…	Moderate
Limited evidence supports that the practitioner might/might not do X, because…	Limited
In the absence of reliable evidence, it is the *opinion* of this work group that…*	Consensus*

*Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII in the original guideline document.

Applying the Recommendations to Clinical Practice

To increase the practicality and applicability of the guideline recommendations in this document, the information listed in Table 3 in the original guideline document provides assistance in interpreting the correlation between the strength of a recommendation and patient counseling time, use of decision aids, and the impact of future research.

Voting on the Recommendations

The recommendations and their strength were voted on by the guideline development group members during the final meeting. If disagreement between the guideline development group occurred, there was further discussion to see whether the disagreement(s) could be resolved. Recommendations were approved and adopted in instances where a simple majority (60%) of the guideline development group voted to approve; however, the guideline development group had consensus (100% approval) when voting on every recommendation for this guideline.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendation Descriptions

Strength	Overall Strength of Evidence	Description of Evidence Quality	Strength Visual
Strong	Strong	Evidence from two or more "High" quality studies with consistent findings for recommending for or against the intervention.	â˜…â˜…â˜…â˜…â˜…
Moderate	Moderate	Evidence from two or more "Moderate" quality studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.	â˜…â˜…â˜…â˜…

Strength	Overall Strength of Evidence	Description of Evidence Quality	Strength Visual
Limited	Low Strength Evidence or Conflicting Evidence	Evidence from one or more "Low" quality studies with consistent findings or evidence from a single "Moderate" quality study for recommending for or against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.	â˜ â˜
Consensus*	No Evidence	There is no supporting evidence. In the absence of reliable evidence, the guideline development group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.	â˜…

*Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII in the original guideline document.

Cost Analysis

Age as a Risk Factor Cost Literature Findings

In the relevant study, patients with both unilateral and bilateral disease in both age groups had improved EuroQol five dimensions questionnaire (EQ5D) scores after total hip arthroplasty, and the average change in scores was 0.27. There was no difference in the change in utility scores when patients older than 65 years of age were compared with patients younger than 65 years or when patients with unilateral disease were compared with those with bilateral disease. The average cost per quality-adjusted life-year (QALY) gained was $9773/QALY. CONCLUSIONS: The data suggest the value of total hip arthroplasty compares favorably with other medical and surgical interventions for other patient groups. No adjustments for patient age or disease status of the contralateral limb are necessary when reporting the value of total hip arthroplasty.

Physical Therapy as a Conservative Treatment Cost Literature Findings

A total of 203 patients were included in the relevant study. The annual direct medical costs per patient were significantly lower for the intervention group (euro 1233) compared to the control group (euro 1331). The average annual societal costs per patient were lower in the intervention group (euro 2634 vs euro 3241). Productivity costs were higher than direct medical costs. There was a very small adjusted difference in quality of life of 0.006 in favor of the control group (95% confidence interval: -0.04 to +0.02).

See Appendix XI in the original guideline document for additional information.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Peer Review

Following the final meeting, the guideline draft undergoes peer review for additional input from external content experts. Written comments are provided on the structured review form (see Appendix VII in the original guideline document). All peer reviewers are required to disclose their conflicts of interest. To guide who participates, the guideline development group identifies specialty societies at the introductory meeting. *Organizations*, not *individuals*, are specified.

The specialty societies are solicited for nominations of individual peer reviewers approximately six weeks

before the final meeting. The peer review period is announced as it approaches and others interested are able to volunteer to review the draft. The chairs of the guideline development group and chair of the American Academy of Orthopaedic Surgeons (AAOS) committee on Evidence Based Quality and Value review the draft of the guideline prior to dissemination.

Some specialty societies (both orthopaedic and non-orthopaedic) ask their evidence-based practice (EBP) committee to provide review of the guideline. The organization is responsible for coordinating the distribution of materials and consolidating their comments onto one form. The chair of the external EBP committees provides disclosure of their conflicts of interest (COI) and manages the potential conflicts of their members.

Again, the AAOS asks for comments to be assembled into a single response form by the specialty society and for the individual submitting the review to provide disclosure of potentially conflicting interests. The peer review stage gives external stakeholders an opportunity to provide evidence-based direction for modifications that they believe have been overlooked. Since the draft is subject to revisions until its approval by the AAOS Board of Directors as the final step in the guideline development process, confidentiality of all working drafts is essential.

The chairs of the guideline development group and the manager of the AAOS Evidence-Based Medicine (EBM) Unit draft the initial responses to comments that address methodology. These responses are then reviewed by the chair and co-chair, who respond to questions concerning clinical practice and techniques. The director of the Department of Research and Scientific Affairs may provide input as well. All comments received and the initial drafts of the responses are also reviewed by all members of the guideline development group. All proposed changes to recommendation language as a result of peer review are based on the evidence and undergoes majority vote by the guideline development group members. Final revisions are summarized in a detailed report that is made part of the guideline document throughout the remainder of the review and approval processes.

The AAOS believes in the importance of demonstrating responsiveness to input received during the peer review process and welcomes the critiques of external specialty societies. Following final approval of the guideline, all individual responses are posted on the AAOS Web site with a point-by-point reply to each non-editorial comment. Reviewers who wish to remain anonymous notify the AAOS to have their names de-identified; their comments, the responses, and their COI disclosures are still posted.

Review of the Management of osteoarthritis of the hip guideline was requested of 21 organizations. Seven individuals representing six organizations returned comments on the structured review form (see Appendix VII in the original guideline document).

Public Commentary

After modifying the draft in response to peer review, the guideline was subjected to a thirty day period of "Public Commentary." Commentators consist of members of the AAOS Board of Directors (BOD), members of the Council on Research and Quality (CORQ), members of the Board of Councilors (BOC), and members of the Board of Specialty Societies (BOS). The guideline is automatically forwarded to the AAOS BOD and CORQ so that they may review it and provide comment prior to being asked to approve the document. Members of the BOC and BOS are solicited for interest. If they request to see the document, it is forwarded to them for comment. Based on these bodies, over 200 commentators have the opportunity to provide input into this guideline. One organization returned public comments.

The AAOS Guideline Approval Process

This final guideline draft must be approved by the AAOS Committee on Evidence Based Quality and Value Committee, the AAOS Council on Research and Quality, and the AAOS Board of Directors. These decision-making bodies are described in Appendix II in the original guideline document and are not designated to modify the contents. Their charge is to approve or reject its publication by majority vote.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is stated for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- The benefits of surgical treatment of osteoarthritis of the hip include relief of pain and improved function.
- In one moderate quality study, physical therapy reduced pain and improved function compared to a non-active control group. In another moderate quality study an exercise intervention improved pain and function to a greater extent than a control group, sham ultrasound group, and active ultrasound group.
- Three high quality studies compared intraarticular injection of corticosteroids with placebo and showed statistically significant improvement in pain and function scores.

Refer to the "Rationale" sections in the original guideline document for information on possible benefits of specific recommendations.

Potential Harms

- Most invasive operative treatments, primarily arthroplasty, are associated with known risks. Early postoperative complications include periprosthetic infection, venous thromboembolic disease, dislocation, fracture, and pain. Late postoperative complications include infection, aseptic component loosening, and pain. All can lead to a need for revision arthroplasty.
- It is possible that patients with specific risk factors may be denied access to the potential benefits of total hip arthroplasty (THA), due to concerns regarding increased risk and/or increased cost of care.
- No extreme adverse events associated with nonsteroidal anti-inflammatory drugs (NSAIDs) were reported; gastrointestinal side effects predominated. Given the short term duration of use in these studies, no comment can be made for longer duration therapeutic safety.
- Risks of intraarticular corticosteroid injection include bleeding, potential injury to adjacent structures, transient pain, allergic reaction, infection before and after total hip arthroplasty, post-injection pain flare and hyperglycemia.
- While there is concern that there may be contraindications to the use of tranexamic acid (TXA), none of the papers cited above demonstrated an increased risk of adverse events related to the perioperative use of TXA for THA.
- It is possible that individuals who participate in a physical therapy program may experience mild and transient adverse events, including pain or stiffness in the hip, back or other body regions.

Contraindications

Contraindications

Contraindications to surgical treatment of osteoarthritis are relative and require an in depth discussion with the patient and physician (surgeon, anesthesiologist) about their individual risk factors. Additional factors, such as the individual's co-morbidities, and/or specific patient characteristics may affect the physician's choice of treatment.

Qualifying Statements

Qualifying Statements

- This Clinical Practice Guideline was developed by an American Academy of Orthopaedic Surgeons (AAOS) physician volunteer guideline development group based on a systematic review of the current scientific and clinical information and accepted approaches to treatment and/or diagnosis. This Clinical Practice Guideline is not intended to be a fixed protocol, as some patients may require more or less treatment or different means of diagnosis. Clinical patients may not necessarily be the same as those found in a clinical trial. Patient care and treatment should always be based on a clinician's independent medical judgment, given the individual patient's clinical circumstances.
- This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician, and other healthcare practitioners.
- Some drugs or medical devices referenced or described in this Clinical Practice Guideline may not have been cleared by the U.S. Food and Drug Administration (FDA) or may have been cleared for a specific use only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or device he or she wishes to use in clinical practice.

Implementation of the Guideline

Description of Implementation Strategy

Guideline Dissemination Plans

The primary purpose of the present document is to provide interested readers with full documentation about not only the recommendations, but also about how the authors arrived at those recommendations.

Shorter versions of the guideline are available in other venues. Publication of most guidelines is announced by an Academy press release, articles authored by the guideline development group and published in the *Journal of the American Academy of Orthopaedic Surgeons*, and articles published in *AAOS Now*. Most guidelines are also distributed at the American Academy of Orthopaedic Surgeons (AAOS) Annual Meeting in various venues such as on Academy Row and at Committee Scientific Exhibits.

Selected guidelines are disseminated by webinar, an Online Module for the Orthopaedic Knowledge Online Web site, Radio Media Tours, Media Briefings, and by distributing them at relevant Continuing Medical Education (CME) courses and at the AAOS Resource Center.

Other dissemination efforts outside of the AAOS will include submitting the guideline to the National Guideline Clearinghouse (NGC), the Guidelines International Network library, and distributing the guideline at other medical specialty societies' meetings.

Implementation Tools

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

American Academy of Orthopaedic Surgeons (AAOS). American Academy of Orthopaedic Surgeons clinical practice guideline on management of osteoarthritis of the hip. Rosemont (IL): American Academy of Orthopaedic Surgeons (AAOS); 2017 Mar 13. 850 p. [96 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017 Mar 13

Guideline Developer(s)

American Academy of Orthopaedic Surgeons - Medical Specialty Society

Source(s) of Funding

This Clinical Practice Guideline was funded exclusively by the American Academy of Orthopaedic Surgeons who received no funding from outside commercial sources to support the development of this document.

Guideline Committee

Guideline Development Group

Composition of Group That Authored the Guideline

Guideline Development Group Members: Greg Polkowski, MD (*Co-Chair*), American Association of Hip and Knee Surgeons; Norman Johanson, MD (*Co-Chair*), The Hip Society; Mark Barba, MD, American Academy of Orthopedic Surgeons (AAOS); John C. Grady-Benson, MD, American Academy of Orthopaedic Surgeons; Theodore Toan Le, MD, American Academy of Orthopedic Surgeons; Harold Rees, MD, American Academy of Orthopedic Surgeons; Ralph T. Salvagno, MD, American Academy of Orthopaedic Surgeons; Richard Schultz, MD, American Academy of Orthopaedic Surgeons; James Browne, MD, American Association of Hip and Knee Surgeons; Courtland G. Lewis, MD, American Association of Hip and Knee Surgeons; Albert Song, MD, American College of Radiology; Joseph A. Zeni, PT, PhD, American Physical Therapy Association; David Podeszwa, MD, Limb Lengthening and Reconstruction Society; Ira Zaltz, MD, Pediatric Orthopaedic Surgeons of North America

Guidelines Oversight Chair: Robert H. Quinn, MD, Appropriate Use Criteria (AUC) Section Leader of the AAOS Evidence-Based Quality and Value Committee

*AAOS Clinical Practice Guidelines Section Leade*r: Gregory Brown, MD, PhD

AAOS Committee on Evidence-Based Quality and Value Chair: Kevin Shea, MD

AAOS Council on Research and Quality Chair: David Jevsevar, MD, MBA

Financial Disclosures/Conflicts of Interest

In accordance with American Academy of Orthopaedic Surgeons (AAOS) policy, all individuals whose names appear as authors or contributors to Clinical Practice Guideline filed a disclosure statement as part of the submission process. All panel members provided full disclosure of potential conflicts of interest prior to voting on the recommendations contained within this Clinical Practice Guidelines.

Applicants with financial conflicts of interest (COI) related to the guideline topic cannot participate if the conflict occurred within one year of the start date of the guideline's development or if an immediate family member has, or has had, a relevant financial conflict. Additionally, all guideline development group members sign an attestation form agreeing to remain free of relevant financial conflicts for one year following the publication of the guideline.

See Appendix IX in the original guideline document for individual work group members' conflicts of interest.

Guideline Endorser(s)

American College of Radiology - Medical Specialty Society

American Physical Therapy Association - Professional Association

Pediatric Orthopaedic Society of North America - Medical Specialty Society

Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the OrthoGuidelines Web site .

All AAOS clinical practice guidelines can be accessed through the AAOS OrthoGuidelines mobile app available from the OrthoGuidelines Web site .

Availability of Companion Documents

None available

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on May 3, 2017. The information was verified by the guideline developer on May 23, 2017.

This NEATS assessment was completed by ECRI Institute on June 22, 2017. The information was verified by the guideline developer on July 18, 2017.

Copyright Statement

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouseâ„¢ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria.

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.